

Serial No. 10/661,214

Part 2 – Amendment to the Claims

1.-12. (Canceled)

13. (Presently Amended) A recirculation system ~~as defined in claim 4~~ for retaining substantial thermal energy content of air drawn from within a confined environment as part of an exhaust flow which includes gaseous contaminants, the gaseous contaminants of the exhaust flow including carbon monoxide gas,
- 5 comprising:
- a collector device located within the confined environment to receive and establish the exhaust flow of contaminants and air from within the confined environment;
- 10 a cleaner device connected to receive the exhaust flow from the collector device;
- the cleaner device comprising a scrubber module, a liquid removal module and a filtering and conversion module connected in series through which the exhaust flow passes;
- 15 the scrubber module including flow passageways through which the exhaust flow passes and into which cleaning liquid is distributed for mixture with and entrainment of contaminants of the exhaust flow;
- the liquid removal module removing cleaning liquid from the flow from the scrubber module;
- 20 the filtering and conversion module comprising an odor-removing filter and a catalyst;
- the odor-removing filter removing odor from the flow from the liquid removal module;
- the catalyst operating at room temperature to facilitate conversion of the carbon monoxide gaseous contaminants in the flow from the liquid removal
- 25 module into benign carbon dioxide gaseous constituents; and
- a delivery device located within the confined environment to receive the flow from the cleaner device and discharge the flow into the confined environment; and wherein the scrubber module further comprises:

Serial No. 10/661,214

- 30 a baffle-defining structure comprising a plurality of vertically spaced and interdigitated deflection plates which define a serpentine-shaped flow passageway through which the exhaust flow moves generally upward; and
- a liquid distributor positioned within the passageway of the baffle-defining structure to flow liquid cleaning agent downward through the passageway and generally onto the deflection plates;
- 35 the baffle-defining structure further comprising a plurality of vertically spaced deflection plates extending generally horizontally in the passageway, each deflection plate having a main portion sloping downward and an outer end lip portion extending from the main portion, vertically adjacent and consecutive deflection plates in the passageway extending in opposite directions with respect
- 40 to one another, the vertically spaced deflection plates interdigitating with one another, and the lip portions horizontally overlapping the main portion of at least one vertically adjacent deflection plate to form the passageway in a serpentine manner having repeated alternating-direction turns around the lip portions of the deflection plates; and
- 45 the liquid flows off the lip portion of each deflection plate into and through the exhaust flow turning around the lip portion to mix the exhaust flow and the liquid to entrain the contaminants in the liquid.
14. (Original) A recirculation system as defined in claim 13 wherein:
the vertically adjacent deflection plates overlap one another within the range of approximately 51% to 80% of the horizontal extent of each deflection plate.
15. (Original) A recirculation system as defined in claim 13 wherein:
the angle of each lip portion relative to the flow around each lip portion causes at least a portion of the liquid flowing from the lip portion of the deflection plate to be driven upward from the lip portion with the flow and mixed
- 5 with the flow.
16. (Original) A recirculation system as defined in claim 13 wherein:
the main portion of the immediately below-positioned deflection plate

Serial No. 10/661,214

and the immediately above-positioned deflection plate define a flow/liquid mixing zone in the passageway between vertically adjacent deflection plates;

5 the angle of each lip portion relative to the flow around each lip portion causes at least a portion of the liquid flowing from the lip portion of the deflection plate to be driven upward from the lip portion with the flow and mixed with the flow in the mixing zone; and

10 the lip portion of each deflection plate extends into the flow to create a vortex motion of the flow in the mixing zone to increase the contact of the contaminants in the flow with the liquid.

17. (Previously Presented) A recirculation system as defined in claim 13 wherein the scrubber module further comprises:

5 a liquid removal device connected to receive the flow from the baffle-defining structure, the flow from the baffle-defining structure containing a mist of liquid, the liquid removal device removing a substantial majority of the liquid mist from the flow before passing into the liquid removal module.

18. (Original) A recirculation system as defined in claim 17 wherein the liquid removal device comprises a cyclone.

19.-22. (Canceled)

23. (Previously Presented) A recirculation system for retaining substantial thermal energy content of air drawn from within a confined environment as part of an exhaust flow which includes gaseous contaminants, comprising:

5 a collector device located within the confined environment to receive and establish the exhaust flow of contaminants and air from within the confined environment;

 a cleaner device connected to receive the exhaust flow from the collector device;

10 the cleaner device comprising a scrubber module, a liquid removal module and a filtering and conversion module connected in series through which the exhaust flow passes;

 the scrubber module including flow passageways through which the

Serial No. 10/661,214

exhaust flow passes and into which cleaning liquid is distributed for mixture with
and entrainment of contaminants of the exhaust flow, wherein the scrubber module
15 further comprises:

a baffle-defining structure comprising a plurality of vertically spaced
and interdigitated deflection plates which define a serpentine-shaped flow
passageway through which the exhaust flow moves generally upward; and

a liquid distributor positioned within the passageway of the baffle-
20 defining structure to flow liquid cleaning agent downward through the passageway
and generally onto the deflection plates;

the baffle-defining structure further comprising a plurality of vertically
spaced deflection plates extending generally horizontally in the passageway, each
deflection plate having a main portion sloping downward and an outer end lip
25 portion extending from the main portion, vertically adjacent and consecutive
deflection plates in the passageway extending in opposite directions with respect
to one another, the vertically spaced deflection plates interdigitating with one
another, and the lip portions horizontally overlapping the main portion of at least
one vertically adjacent deflection plate to form the passageway in a serpentine
30 manner having repeated alternating-direction turns around the lip portions of the
deflection plates;

the liquid flows off the lip portion of each deflection plate into and
through the exhaust flow turning around the lip portion to mix the exhaust flow and
the liquid to entrain the contaminants in the liquid;

35 the liquid removal module removing cleaning liquid from the flow from
the scrubber module;

the filtering and conversion module comprising an odor-removing
filter and a catalyst;

the odor-removing filter removing odor from the flow from the liquid
40 removal module;

the catalyst facilitating conversion of the gaseous contaminants gas
in the flow from the liquid removal module into benign gaseous constituents; and

FEB 20 2007

Serial No. 10/661,214

a delivery device located within the confined environment to receive the flow from the cleaner device and discharge the flow into the confined
45 environment.

24. (Previously Presented) A recirculation system as defined in claim 23 wherein:

the vertically adjacent deflection plates overlap one another within the range of approximately 51% to 80% of the horizontal extent of each deflection
5 plate.

25. (Previously Presented) A recirculation system as defined in claim 23 wherein:

the angle of each lip portion relative to the flow around each lip portion causes at least a portion of the liquid flowing from the lip portion of the
5 deflection plate to be driven upward from the lip portion with the flow and mixed with the flow.

26. (Previously Presented) A recirculation system as defined in claim 23 wherein:

the main portion of the immediately below-positioned deflection plate and the immediately above-positioned deflection plate define a flow/liquid mixing
5 zone in the passageway between vertically adjacent deflection plates;

the angle of each lip portion relative to the flow around each lip portion causes at least a portion of the liquid flowing from the lip portion of the deflection plate to be driven upward from the lip portion with the flow and mixed with the flow in the mixing zone; and

10 the lip portion of each deflection plate extends into the flow to create a vortex motion of the flow in the mixing zone to increase the contact of the contaminants in the flow with the liquid.

27. (Previously Presented) A recirculation system as defined in claim 23 wherein the scrubber module further comprises:

a liquid removal device connected to receive the flow from the baffle-defining structure, the flow from the baffle-defining structure containing a mist of

Serial No. 10/661,214

- 5 liquid, the liquid removal device removing a substantial majority of the liquid mist from the flow before passing into the liquid removal module.

28. (Previously Presented) A recirculation system as defined in claim 27 wherein the liquid removal device comprises a cyclone.

29. (Previously Presented) A recirculation system as defined in claim 23 wherein the liquid removal device comprises:

- a curved sidewall structure along which the flow from the scrubber module moves in a curved motion to force liquid in the flow from the scrubber
5 module to coalesce into liquid and drain along the sidewall structure.

30. (Previously Presented) A recirculation system as defined in claim 29 wherein the curved sidewall structure also forces the contaminants in the flow against the sidewall structure to become entrained in the liquid on the sidewall structure.

31. (Previously Presented) A recirculation system as defined in claim 29 further comprising a demisting wall positioned in the flow between the scrubber module and the liquid removal module to remove a part of the liquid mist in the flow from the scrubber module.

32. (Previously Presented) A recirculation system as defined in claim 23 wherein the confined environment is a food preparation establishment having an open flame cooker which produces the carbon monoxide gas, odor, smoke and airborne grease as particulate and gaseous cooking exhaust contaminants, and
5 wherein:

the collection device comprises an exhaust collection hood located over the open flame cooker;

the scrubber module removes substantially all of the particulate contaminants from the exhaust flow; and

- 10 the catalyst facilitates conversion of the carbon monoxide gas in the flow from the liquid removal module into the carbon dioxide gas.

33. (Previously Presented) A recirculation system as defined in claim 32 wherein:

Serial No. 10/661,214

the delivery device discharges the flow from the filtering and conversion module into the exhaust hood.

34. (Previously Presented) A recirculation system as defined in claim 23 wherein:

the catalyst utilizes air from the exhaust flow and carbon monoxide from the flow to facilitate formation of the carbon dioxide.

35. (Previously Presented) A recirculation system as defined in claim 23 wherein:

the catalyst comprises mixed manganese copper oxide.

36. (Previously Presented) A recirculation system as defined in claim 23 wherein the contaminants from the exhaust flow include odor, and wherein:

the filter comprises a carbon particle filter.

37. (Previously Presented) A recirculation system as defined in claim 23 further comprising:

a heater positioned to heat the catalyst to a predetermined temperature sufficient to regenerate catalytic characteristics of the catalyst.

38. (Previously Presented) A recirculation system as defined in claim 23 wherein the filtering and conversion module includes a catalyst cell comprising:

a layer of particles of the room-temperature catalyst; and

a layer of carbon particles.

39. (Canceled)

40. (Previously Presented) A recirculation system as defined in claim 23 wherein the filtering and conversion module further comprises:

a filter device connected to receive the flow from the liquid removal device, the filter device comprising one of a HEPA, DOP or BAG filter.